The use of the Unidata Science Gateway as a cyberinfrastructure resource to facilitate education and research during COVID-19

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Unidata has developed and deployed data infrastructure and data-proximate scientific workflows and software tools using cloud computing technologies for accessing, analyzing, and visualizing geoscience data. These resources are provided to educators and researchers through the Unidata Science Gateway (https://science-gateway.unidata.ucar.edu) and deployed on the U. S. National Science Foundation funded Jetstream (https://jetstream-cloud.org) cloud facility. During the SARS-CoV-2/COVID-19 pandemic, the Unidata Science Gateway has been used by many universities to teach data-centric atmospheric science courses and conduct several software training workshops to advance skills in data science.

The COVID-19 pandemic led to the closure of university campuses with little advance notice. Educators at institutions of higher learning had to urgently transition from in-person teaching to online classrooms. While such a sudden change was disruptive for education, it also presented an opportunity to experiment with instructional technologies that have been emerging for the last few years. Web-based computational notebooks, with their mixture of explanatory text, equations, diagrams and interactive code are an effective tool for online learning. Their use is prevalent in many disciplines including the geosciences. Multi-user computational notebook servers (e.g., Jupyter Notebooks) enable specialists to deploy pre-configured scientific computing environments for the benefit of students. The use such tools and environments removes barriers for students who otherwise have to download and install complex software tools that can be time consuming to configure, simplifying workflows and reducing time to analysis and interpretation. It also provides a consistent computing environment for all students and democratizes access to resources. These servers can be provisioned with computational resources not found in a desktop computing setting and leverage cloud computing environments and high speed networks. They can be accessed from any web browser-enabled device like laptops and tablets.

Since spring 2020 when the Covid pandemic led to the closure of universities across the U. S., Unidata has assisted several earth science departments with computational notebook environments for their classes. We worked with educators to tailor these resources for their teaching objectives. We ensured the technology was correctly provisioned with appropriate computational resources and collaborated to have teaching material immediately available for students. There were many successful examples of online learning experiences.

In this paper, we describe the details of the Unidata Science Gateway resources and discuss how those resources enabled Unidata to support universities during the COVID-19 lockdown.